Advisory
June 2003

# PCB Advisory for Schools:
## *How Voluntary Lighting Retrofits Can Address Hidden Dangers*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

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***DTSC is one of six Boards and Departments within the California Environmental Protection Agency. DTSC's mission is to restore, protect and enhance the environment, to ensure public health, environmental quality and economic vitality, by regulating hazardous waste, conducting and overseeing cleanups, and developing and promoting pollution prevention.***

State of California

California Environmental Protection Agency

## Advisory Contents



## 1. Purpose

The Department of Toxic Substances Control (DTSC) developed this Advisory to assist school districts in addressing potential contamination from fluorescent light ballasts containing polychlorinated biphenyls (PCBs). This Advisory alerts school districts to the potential hazards from aging PCB ballasts and provides guidance for identifying, removing, and managing PCB ballasts. The Advisory also provides information regarding the availability of DTSC oversight for management of PCB releases and cleanups. Additional funding resources for retrofit and waste disposal costs are also discussed, such as energy assistance grants and school modernization bonds.

The California Education Code requires DTSC to oversee environmental assessments for proposed school sites that will receive state funding for acquisition and/or new construction. These requirements were developed in order to address concerns raised by parents, teachers, local communities, and the state legislature. Environmental assessments identify hazardous materials which may pose a health threat to children and faculty on school properties.


*Acknowledgment: Photos were provided by U.S. EPA or obtained from school projects under DTSC's oversight.*


*The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our web site at www.dtsc.ca.gov.*

***PCBs leaking on to a classroom tool box.***

Recently, DTSC has been called upon to assist school districts where leaking light ballasts containing PCBs were found in classrooms, potentially exposing teachers and students to chemical hazards. Although production of PCBs was banned in the United States by the Toxic Substances Control Act (TSCA) in 1978, continued use of PCB-containing items was not prohibited. All light ballasts manufactured through 1978 were magnetic and contained PCBs. Almost all older fluorescent light fixtures have PCB ballasts. Light fixtures containing PCB ballasts were distributed until about 1980.

DTSC recommends that school districts survey and inventory all light fixtures and begin replacing those identified to contain PCBs in the ballasts. Postponing a lighting retrofit may increase the risk of a PCB leak or fire, which could result in serious health and environmental impacts for students and staff, escalated replacement costs due to the need for emergency cleanups, and possible penalties for violation of laws. A school that voluntarily retrofits its aging light ballasts might expect to recover its costs within two years with potential rebates and lower energy costs with the installation of new energy-efficient lighting systems.

## 2. PCBs – Historical Use

PCBs are man-made chemicals commonly used in the past as coolants and lubricants. The use of PCBs as insulation in electrical equipment was popular because they are very stable chemicals with low water solubility, high boiling point, low flammability and low electrical conductivity. Prior to 1978, PCBs were often used in the manufacturer of transformers and capacitors. They are associated with waste oil, caulking compounds, hydraulic systems, and fluorescent light ballasts.

PCBs were produced in the United States (U.S.) from approximately 1929 to 1977. PCB production was banned by TSCA in 1978 due to evidence showing that they accumulated in the environment and were linked to harmful health effects. However, TSCA did not prohibit the use of PCB-containing items manufactured prior to the 1978 ban. It is estimated that fluorescent light fixtures containing PCB ballasts were available until 1980. Many of these PCB-ballasts are still working far beyond their intended life; as they age, they become more likely to leak or drip.

PCBs are found in the form of a clear to yellow, heavy oily liquid or waxy solid. Light ballasts are the electronic components generally located at the end of fluorescent light fixtures under a metal overplate. Prior to 1978, ballasts were commonly manufactured with PCBs in the capacitor oil and in a tar-like substance that surrounds ballast components called "potting compound." The capacitor and potting compound, encased in metal, contain about an ounce of nearly pure (90%) PCBs.

## 3. PCB Hazards – Health Concerns

The most common health effect that has been found in people exposed to high levels of PCBs for short periods of time are skin conditions such as acne and rashes. Liver effects and damage have also been reported following high levels of exposure. Women who have been exposed to high levels of PCBs have been reported to have had babies with lower birth weights and some problems with motor skills and memory. Of greatest concern is that prolonged exposures to PCBs may cause cancer in people, based on information from animal studies. Additional health effects that have been seen in animals exposed to PCBs for long periods include changes in the immune system and impaired reproduction.

PCBs do not readily break down into safer chemicals in the environment and they have been shown to persist for many years. People can also store PCBs in their fat tissue for many years, which can reflect a number of environmental sources of PCB exposures. If a PCB-ballast catches on fire, the PCB oil may produce by-products, such as dioxin and furans, generally considered more toxic than PCBs themselves.

The most common ways that people can be exposed to PCBs from leaking light ballasts is by touching or accidentally ingesting PCB oils or PCB-contaminated materials. When PCBs are present in high concentration, people may also be exposed by breathing contaminated air. Given the nature of PCBs and their possible adverse health effects, a conservative approach is recommended to minimize the possibility of exposure. For more information about the health effects of PCBs, please refer to the following Web sites: *www.epa.gov/pcb/effects.html* or *www.atsdr.cdc.gov/tfacts17.html*.

As PCB ballasts age, the chemicals may leak out and create a potential health and environmental hazard. The hazard is worsened when the incident is mishandled. U.S. EPA reported that improper cleanup of leaking ballasts at several schools in Oregon in 1999 and 2000 potentially exposed school staff and maintenance workers to PCBs.

## 4. Laws, Regulations, and Penalties for Mishandling PCB Wastes

### Laws and Regulations

PCB manufacture, use, storage and disposal are regulated by U.S. EPA under TSCA and Part 761, Title 40 of the Code of Federal Regulations (40 CFR Part 761). TSCA regulates any materials or wastes that contain PCBs at concentrations of 50 ppm (parts per million) or greater. Light ballasts containing PCB oil in the small capacitor or the potting compound are included in this regulation.

Leaking PCB ballasts are regulated as hazardous wastes and toxic substances. Proper handling and cleanup of leaking PCB ballasts is necessary to protect public health and the environment. TSCA regulates disposal of PCB wastes with concentrations over 1 ppm. Leaking PCB light ballasts often generate wastes in excess of 1 ppm. In addition, PCBs are regulated under TSCA if an impervious surface shows 10 micrograms (ug) per 100 square centimeters ($cm^2$) of PCBs. Examples of this in the classroom are the surfaces of floors, desks, and bookcases.

PCB wastes are also regulated as hazardous waste by DTSC under the Health and Safety Code (HSC) and Title 22 of the California Code of Regulations (22 CCR). Criteria for determining PCB wastes are:

- total threshold limit concentration (TTLC) of 50 ppm of PCBs, and/or
- soluble threshold limit concentration (STLC) of 5 ppm of PCBs as oily liquid.

The HSC, 22 CCR, and other information pertaining to the management and transportation of hazardous wastes are available at *www.dtsc.ca.gov*.

### PCB Generators

School districts can be considered generators of PCB wastes under state and federal laws. Generators of PCB wastes may be subject to notification and liability provisions under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) of 1980. The National Response Center must be notified if wastes from cleanups of spills (leaks or fires) contain:

- one pound or more of PCBs (roughly about 12 ballasts) disposed within a 24-hour period; or
- ten pounds or more of PCBs.

### *Mishandling of PCBs – Legal Penalties*

DTSC recommends that school districts focus on prevention and compliance. However, districts should be aware that a violation of laws and regulations is considered to have occurred once any PCB leaks from ballasts are identified. In addition, failure to follow the federal and state laws for managing PCB-containing equipment and wastes can result in penalties, which can cost school districts thousands of dollars. Federal and state laws authorize civil penalties of up to $27,500 per day per violation and criminal penalties.


***PCB ballasts improperly stored in open bins.***

In response to complaints about leaking fluorescent lights, U.S. EPA inspected several schools in Oregon in 1999 and 2000 and discovered PCB violations, which included: 1) light ballasts that had leaked oil over books, desks and other school equipment; 2) old ballasts that were removed from light fixtures and improperly stored in open bins; 3) leaking PCB ballasts that were being stored on the school playground; and 4) workers handling leaking PCB ballasts who were not trained to handle hazardous materials.

U.S. EPA's investigation concluded that there were a significant number of TSCA violations involving use, storage, and disposal at those schools. U.S. EPA also had concerns about whether maintenance workers or school staff had been exposed to high levels of PCBs. Although the school districts have now cleaned up the PCBs, they are still facing financial penalties sought by U.S. EPA for alleged violations of the federal PCB regulations.

***Florescent light fixtures with PCB ballasts improperly stored on a school playground.***

## *5. Health and Safety Considerations During PCB Work*

School districts are responsible for ensuring that personnel who perform PCB work (e.g., inspecting light ballasts, cleaning up the PCB leaks) are trained and qualified to do so. They must also follow the most current Occupational Safety and Health Administration (OSHA) regulations including 29 CFR 1910.120 and 8 CCR 5192, Hazardous Waste Operations and Emergency Response, as well as other applicable federal, state and local laws and regulations.

To prevent exposure while performing PCB work, DTSC recommends that workers adhere to the following safety precautions:

- Wear personal protective clothing, including chemically-resistant gloves, goggles, boots, and disposable overalls.
- Ensure the work area is well-ventilated to minimize the potential for breathing in fumes.
- Use a respirator if proper ventilation of the area is not possible or not advised due to potential exposure.

Any skin contact may constitute overexposure because PCBs are easily absorbed through skin. If exposure occurs, contaminated clothing should be immediately removed and contaminated skin and/or eyes should be washed with water for at least 15 minutes. If fumes are inhaled, workers should be immediately moved to an unimpacted area. For safety reasons, a physician should be consulted as soon as possible after exposures.

## 6. Management of PCB-Containing Materials

DTSC recommends that lighting retrofits be performed in accordance with this advisory. For routine retrofits, no direct DTSC oversight is required. However, DTSC should be consulted in the event that leaks or spills are identified. DTSC recommends that school districts hire only experienced environmental consultants to manage the removal, storage, disposal, and remediation of leaking PCB light ballasts.

### Disposal Considerations

Safe disposal of old ballasts and fluorescent tubes is critical because the ballasts contain PCBs and the fluorescent tubes contain mercury. Waste ballasts and tubes from a lighting retrofit should be handled as hazardous waste. There are specific requirements for the packing, labeling, storing, transportation, reporting, and disposing of the waste streams resulting from cleanup of PCB ballast leaks or fires. For a list of approved incinerator facilities or specific handling requirements for PCB wastes, call the TSCA hotline at (202) 554-1404, or refer to the PCB Web site at *www.epa.gov/pcb*.

### Disposal Requirements

Federal law requires that any ballast with leaking PCBs must be incinerated at a U.S. EPA-approved high temperature incinerator. Non-leaking PCB ballasts may be sent to a U.S. EPA-approved incinerator, landfill, or ballast recycling facility. A current list of such U.S. EPA-approved facilities is available at *www.epa.gov/pcb/stordisp.html*. All other hazardous wastes generated from light retrofitting and classroom cleanup projects should be shipped to an approved hazardous waste management facility.

### Packaging, Storage and Shipping Requirements

All PCB wastes must be packaged in a PCB approved container marked, "Contains PCBs." Each school needs to obtain a hazardous waste generator identification number, commonly known as an "EPA ID Number," from DTSC by calling (800) 618-6942. Each school district will also need to prepare a Uniform Hazardous Waste Manifest before transporting any hazardous waste. Blank manifest forms are available at *www.dtsc.ca.gov*. All PCB wastes must be shipped by an authorized PCB or hazardous waste transporter with a proper manifest to an authorized disposal facility. A current list of registered hazardous waste transporters is available at *www.dtsc.ca.gov/HazardousWaste/Trans000.cfm*. A hazardous waste storage facility permit may be required for storing hazardous wastes for more than 180 days.

### School Employees

School districts deciding to have their own employees do their PCB remediation work should make sure they meet all state and federal guidelines for both training employees and performing the work following the strict procedures. Additional information about managing PCB-containing wastes can also be found at *www.epa.gov/r10earth/pcb.htm*.

### Offsite Transportation and Storage

Special offsite transportation and storage authorization is also available for certain hazardous wastes (including PCB ballasts and fluorescent tubes) generated by routine operation and maintenance of schools. For more information on Schools Hazardous Waste Collection, Consolidation, and Accumulation Facilities operating under Permit by Rule, please contact the Public and Business Liaisons (Duty Officers) at 800-728-6492 or see DTSC's Web site at *www.dtsc.ca.gov/LawsRegulationsPolicies/SHWCCAF/SHWCCAF_final_regs.html*.

## 7. Lighting Retrofit Management

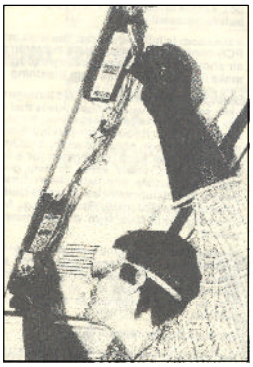
In order to survey light ballasts for PCBs, school districts should develop a plan to arrange, store, and dispose of PCB ballasts in accordance with state and federal regulations. Please see Attachments A and B for information on related publications and funding resources for lighting retrofits in schools. The following steps outline the course of action DTSC recommends for management of a lighting retrofit:

### Step A: Inventory—Identifying PCB Ballasts

DTSC encourages school districts to voluntarily identify PCB ballasts and establish an inventory of all PCB ballasts at any school built before 1980. DTSC recommends that light fixtures be evaluated during routine maintenance to determine the condition and age of the ballasts. At a minimum, a visual inspection of a representative number of light fixtures (including ballasts and tubes) is recommended to determine the presence of PCB ballasts.

**Qualification of Inspectors.** School staff may conduct the routine inspection. Since PCBs can be easily absorbed through skin, all workers should wear proper personal protective equipment while inspecting light fixtures. See Section 5, Health and Safety Considerations during PCB Work, for more information.

**Inspection Procedures.** Inspection may be accompanied by removing the metal panel covering the light fixture. After removing the metal panel of the light fixture, one can easily inspect the PCB ballast. Documentation should be kept of the areas (e.g., classroom 101) and location of the lights surveyed.



It is extremely important to learn if a ballast containing PCBs is leaking before its removal from the light fixture so that the ballasts can be properly handled. As long as PCBs remain in the ballasts, they do not pose a health risk or environmental hazard. If a leaking ballast is discovered, it should immediately be replaced and properly disposed. See Section 8, Emergency Responses for PCB Ballast Leaks or Fire.

**Identification of PCB Ballasts.** The following guidelines may be used to identify ballasts that contain PCBs:

- All ballasts manufactured through 1978 are magnetic ballasts that contain PCBs. Almost all older fluorescent light fixtures have PCB ballasts because the use of PCB-containing items was allowed to continue beyond the 1978 ban. Because the supply of PCB containing ballasts likely lasted for several years after the ban took effect, any building built before 1980, without a complete lighting retrofit, is likely to have PCB ballasts.
- Magnetic ballasts manufactured after 1978 that do not contain PCBs are labeled "No PCBs." These non-PCB magnetic ballasts may contain di-2-ethylhexylphthalate (DEHP).
- Electronic ballasts are PCB-free and should be clearly marked as electronic.
- If a ballast has no manufacture date or is not specifically labeled, "No PCBs," it should be assumed to contain PCBs.

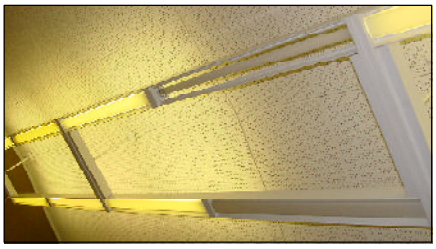
### Step B: Timetable—Planning for a Retrofit

Lighting retrofits can improve classroom lighting quality, reduce maintenance needs, save energy, minimize worry and liability, and thus provide a more comfortable and productive learning environment. A complete retrofit will replace the entire lighting fixture, including old fluorescent tubes and ballasts, with more energy-efficient fixtures. Ideally, a lighting retrofit can be performed as part of an overall modernization effort to ensure safe, cost effective school upgrades.

DTSC encourages school districts to plan a retrofit as soon as possible. If a school has PCB ballasts but is not planning a lighting retrofit, DTSC recommends that school administrators consider developing a contingency plan for PBC spills and setting up a contract with environmental consultants now to facilitate the cleanup or decontamination process, should it become necessary. Otherwise, the area of the leak or fire could be off-limits for several months instead of several weeks due to rigorous PCB cleanup requirements.

**Cost Estimates.** The size of the school district and the number of classrooms built before 1980 vary from school district to school district. Replacement costs may vary; however, it is estimated that replacement costs for a typical classroom with 12 sets of 4-lamp fixtures would be approximately $3,000 (including material, labor, and waste disposal). Additional costs may be required for disposal of leaking PCB ballasts.

### *Step C: Implementation—Replacement and Disposal*



School lighting upgrade project specifications should include provisions for proper handling and safe disposal of lamps, ballasts, and other hazardous materials that may be associated with the project.

**Recommended Replacement Procedures.**

- Disconnect all power and de-energize all electrical equipment to be retrofitted under the supervision of a licensed electrician.
- Inspect each fluorescent light fixture for leaking and to determine if ballasts contain PCBs.
- Disconnect and remove all ballasts, incidental PCB-contaminated items, and tubes from the lighting fixture housings and compartments.
- Provide appropriate containers and packing materials for packaging and storing the four possible types of waste streams.
- Maintain a record for each area (e.g., classroom, hallway) where lighting fixtures are removed, including how many leaking vs. non-leaking PCB-containing ballasts were removed from each area.

**Classification and Disposal of Light Retrofit Wastes.** In general, there are four types of retrofit waste streams resulting from a light retrofit. See Section 6 for more information on handling and disposal of light retrofit wastes.

- Waste Stream 1, Leaking PCB Ballasts and Cleanup Wastes. These wastes must be managed as hazardous PCB wastes and sent to an US EPA-approved high-temperature incinerator. Leaking PCB ballasts should be handled with extreme caution to avoid exposure, contamination, and liability.
- Waste Stream 2, Intact, Non-Leaking PCB Ballasts. As long as the PCBs remain in the ballasts, they do not pose a health risk or environmental hazard. However, these wastes must be managed as hazardous wastes and sent to an approved hazardous waste disposal facility (landfill or high temperature incinerator) or an out-of-state PCB ballast recycling facility.
- Waste Stream 3, Non-PCB Ballasts. Non-PCB ballasts manufactured between 1979 and 1985 may contain di-2-ethylhexylphthalate (DEHP). As a waste generator, the school district must determine whether the non-PCB ballast wastes are hazardous or not, and dispose of them properly. DTSC recommends these wastes be shipped to a light ballast recycling facility.
- Waste Stream 4, Mercury-Containing Tubes. If tested, fluorescent tubes will likely exceed hazardous waste concentrations for mercury; these tests are also very costly (approximately $100 per tube). Therefore, DTSC recommends that all fluorescent tubes that are not tested should be assumed to contain mercury and be handled as hazardous waste.

**Record Keeping Requirements.** DTSC requires that a record be maintained for each drum used to store PCB-containing ballasts. The record should include:

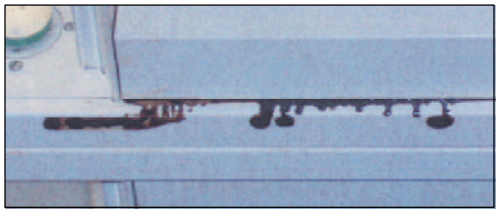
- the number of ballasts in the drum;
- the condition of the ballasts–leaking or non-leaking;
- the date the first ballasts were placed in the drum;
- the destination of the ballasts;
- the name of the contractor packing the drum; and
- the name and address of the waste generator (e.g., the school's name).

**Transporting Requirements.** DTSC requires that drums should be packed, labeled and stored the drums in accordance with federal, state, and local regulations until a registered hazardous waste transporter removes them to an appropriate disposal facility for each type of waste stream. Manifests and other related documentation for the removal, transportation, storage, and disposal of PCB wastes should be prepared and submitted to appropriate regulatory authorities in a timely manner.

**Reporting Requirements.** Notify the appropriate federal, state, and local authorities and follow documentation requirements for record keeping or reporting.

## 8. Emergency Responses for PCB Ballast Leaks or Fire

Indications of leaking PCB ballasts may include the presence of an oily film on the metal casing, a leaking putty-like compound (the potting material), or discoloration of the metal casing. Other leaking signs include drips, buzzing, and discoloration of the light ends. Almost all ballast casings are a single color (often black or white) with a contrasting label. Leaks, when present, are usually found around the metal seams of the casing.



***PCBs leaking out of metal casing.***

***A burned PCB ballast.***

Indications of a burning PCB ballast may include: an acrid and burning tar odor; melted tar oozing from the casing seams; and visible electrical lead bushings. It is very rare for PCB ballasts to actually catch on fire. However, when a PCB leak or fire occurs, DTSC recommends that school districts notify DTSC to oversee proper cleanup and post-cleanup sampling.

### Emergency Response Procedures

PCB Spill Cleanup Policy is specified in TSCA (40 CFR Part 761 Subpart G), and applies to spills of oily liquids containing PCBs at concentrations of 50 ppm or greater. If a leaking PCB ballast or PCB ballast fire is discovered, DTSC recommends the following emergency responses:

- Evacuate the room or area immediately to prevent any exposure through touching a substance or inhaling fumes from the leak or fire. When there is a PCB leak, open any windows to ventilate the room to the outside. Turn off electricity to the affected area.
- Call 911 for an appropriate local emergency response team. PCB ballast fires are especially dangerous because burning PCBs produce other highly toxic substances such as dioxins and furans. It is best to allow the trained professionals in the Fire Department to respond to the fire. In addition, after a fire, the area must be tested not only for PCBs, but also for dioxins and furans.

- Isolate the impacted area and keep students and staff at least 10 feet away from the area. Mark the area with a sign to minimize potential exposure.
- Notify appropriate local and state authorities including DTSC. If the spills (leaks or fires) contain one pound or more of PCBs (roughly equivalent to 12 ballasts) in a 24 hour period, school districts must promptly notify the National Response Center at (800) 424-8802. If the spill is greater than 10 pounds, report the spill to U.S. EPA Region 9 at (415) 947-4163.
- Hire an experienced contractor to manage the cleanup and prevent further leaking. Initiate cleanup within 24 hours after the spill is discovered. Clean up all visible traces. Post- cleanup confirmation sampling is required with a minimum of three (3) samples per area or classroom to ensure adequate cleanup.

### *DTSC Oversight*

DTSC recommends that school districts contact DTSC, following stabilization of emergency conditions, to oversee cleanup and confirmatory sampling. DTSC staff is available to provide guidance, to oversee cleanup, and to address any questions or problems that may arise during PCB cleanup process.

### *Cleanup Standards*

- Solid Surface. The DTSC-recommended cleanup standard for PCBs on surface areas is 0.1 ug/100 $cm^2$. This standard is protective for teachers and students. This value was derived to be protective of potential carcinogenic effects of PCBs from long-term dermal exposure to contaminated surfaces and incidental ingestion from hand-to-mouth contact. In the event that new technology allows for a lower detection limit, or additional research indicates the need, this standard may be modified. This standard is also protective for short-term exposures and potential health effects associated with those exposures.
- Soil. The DTSC-recommended cleanup standard for PCB spills on soil is 0.3 ppm. At a minimum, soil should be excavated of all visible staining along with 10 inches below and a one foot buffer around the spill area.

### *Confirmation Sampling*

DTSC recommends that after completion of a cleanup of PCB spills, confirmation sampling should be conducted in any classroom where PCB leaks have occurred or were suspected to have occurred in order to ensure the room has been properly remediated and is safe for students and staff. Impervious surface areas should be confirmed clean by wipe sampling. If there was a PCB fire in a class room, air sampling in that classroom may also be conducted. DTSC has developed wipe sampling and air sampling plan protocols (see Attachments C and D) for use by school districts. DTSC recommends that both wipe sampling and air sampling be conducted only under DTSC oversight.

## *9. Public Concerns and Complaints*

State laws require school districts to protect the health of students, teachers, and school workers from environmental hazards in their schools. Employees have the right under law to refuse to work in hazardous or unsafe conditions. Employees also have the right to contact government agencies, such as DTSC or Cal/OSHA, with concerns about safety and health hazards in the workplace. DTSC recommends that accurate information regarding a school district's lighting retrofit and/or cleanup activities be provided to faculty, parents, and other community members. If contacted, DTSC will notify the school district of the complaint, and will conduct an investigation to determine if there are health risks to the public or to the environment due to contamination. DTSC will advise school districts of any findings and any mitigation activities that may be required.

# Attachment A
# Funding for School Lighting Retrofits

## State Programs

The following state agencies may provide funding for lighting retrofits at schools:

**California Department of Education (CDE)** has indicated that lighting retrofits may be incorporated into the school modernization plan eligible for school facilities funding or deferred maintenance funding.

**California Energy Commission's Bright Schools Program (BSP)** helps school districts identifying ways to reduce energy cost by conducting free school energy audits and other technical studies. Energy savings from lighting retrofits may be significant. BSP provides low-interest rate loans to fund lighting retrofits and other energy saving projects. Payback the loan is based on the energy savings. Since late 1970s, BSP has issued over $134 million in loans to 650 organizations. Currently, BSP has about $30 million in loans available for energy efficiency projects, such as lighting retrofits. In addition, BSP has provided free energy audits to over 303 school districts to identify energy saving projects. For more information about BSP, please look at BSP Web site at *www.energy.ca.gov/efficiency/brightschools* or call (916) 654-4008.

**Department of General Services (DGS)** provides services, including initial energy audit, due diligence review, investment grade audit, funding, preliminary plan/working drawing review, new design review, and construction management. DGS has a pool of consultants ready to use to support studies, audits, reviews, and modeling. For more information about the DGS services, please look at the Web site at *www.emd.dgs.ca.gov/ProjDev/default.html* or call (916) 323-8777.

## Federal Programs

U.S. EPA's Energy Star Program offers assistance through workshops and information services on installation of energy-efficient lighting technologies. These materials are available at www.energystar.gov. U.S. EPA also offers lists of approved storage and disposal facilities through its Web site at *www.epa.gov/opptintr/pcb*.

## Energy Providers

Many energy companies may offer incentive programs to support energy efficiency improvements such as lighting upgrades, including technical assistance, rebates, or other funding assistance to support lighting upgrade projects. Call your energy provider to see which programs are available.

# Attachment B
# Publications about PCB Retrofits

## PCB Publications

The following PCB Publications may be requested by phone at (800) 490-9198 or on the Web site at *www.epa.gov/region09/cross_pr/p2/projects/pcbs.html*:

- A Guide for School Administrators – Removing PCBs from Light Fixtures: Protecting Students from Hidden Dangers, EPA 909B-00-003
- A Guide for School Maintenance Personnel – Removing PCBs from Light Fixtures: Protecting Students from Hidden Dangers, EPA 909B-00-002

## PCB Light Ballasts

Additional information about managing PCB ballasts is available at:

- *www.epa.gov/pcb/index.html (Welcome to the PCB Home Page at EPA);*
- *www.epa.gov/r10earth/pcb.html*
- *www.atsdr.cdc.gov/tfacts17.html*

## Information Contacts

Ken Chiang
Schools Coordinator, DTSC
(818) 551-2860
e-mail: *kchiang@dtsc.ca.gov*

Mardis Coers
PCB Coordinator, DTSC
(916)-322-0712
e-mail: *mcoers@dtsc.ca.gov*

Max Weintraub
Regional PCB Coordinator
U.S. EPA Region 9
(415) 947-4163
e-mail: *weintraub.max@epa.gov*

TSCA Hotline at (202) 554-1404

# Attachment C
# Wipe Sampling Plan (Protocols)

## Wipe Sampling Locations

Wipe samples will be collected from the selected classrooms, in consultation with the existing school administration and the Department of Toxic Substances Control (DTSC).

At a minimum, three (3) classrooms should be selected if investigation of PCB spills is needed. Additional classrooms may be sampled, depending on site conditions, accessibility, use, and proximity to the site. Investigation samples will be collected from stained spots or areas.

For post-cleanup confirmation sampling purposes, every classroom with known or suspected leaking light fixtures should be sampled after completion of the cleanup. Confirmation samples will be collected from the cleanup areas.

Potential Sampling Locations

- counter or desk surfaces
- top of bookshelves
- light fixtures/ballasts
- HVAC ducts
- window sills, especially sills of windows facing the suspected source area
- stained vinyl or linoleum floor

Smooth, Impervious Surfaces

Only smooth, impervious surfaces, such as metals, glass, aluminum siding, enameled or laminated surfaces, coated desk surfaces, and vinyl floors, should be sampled using wipe sampling protocols. At least three smooth, impermeable surfaces that would be available for exposure by direct contact will be sampled in each classroom. In general, a post-cleanup wipe sample should indicate whether the cleanup has sufficiently removed the PCBs. These samples should include:

- one infrequently contacted surface (e.g., top of bookshelf, suspended light fixture);
- one frequently contacted surface (e.g., desk, counter top, window sills); and
- one floor surface.

Porous and Non-Impervious Surfaces

Wipe sampling protocols are not applicable for surfaces with porous or non-impervious media (e.g., concrete, wood, asphalt, plasterboard), because long-term accumulation of and penetration of contaminants into the matrix may occur. Subsequent extraction by a solvent or wetting agent would result in collection of material that may not be readily available for exposure by direct contact. Chip samples or other collection methods may be recommended in some instances. Please consult with DTSC if potentially contaminated porous surfaces are present.

If the selected classroom is completely carpeted, the floor of this classroom cannot be sampled using wipe sampling protocols. NOTE: If carpet exists in a room where light ballasts have leaked PCBs, the carpet and its padding may need to be removed, the floor cleaned, and new carpet installed.

### *Wipe Sampling Protocol*

Wipe samples should be collected over a 100 $cm^2$ surface area using Wash n' Dri™ hand wipes (or 2 inch by 2 inch cotton gauze pads wetted with n-hexane). The surfaces should be sampled by first applying an appropriate solvent (e.g., hexane) to a piece of Wash n' Dri™ hand wipe. This moistened hand wipe is held with a pair of stainless steel forceps and used to thoroughly swab a 100 $cm^2$ area as measured by a sampling template.

NOTE: NIOSH 9100 (Lead in Surface Wipe Samples) suggests that Whatman Filters should not be used because they tend to not hold up during the wiping process. The method references Wash n' Dri ™ hand wipes.

Sampling Medium

- Wash n' Dri™ hand wipes (or 2 inch x 2 inch cotton gauze pad)
- The Wash n' Dri™ hand wipe (or gauze pad) should be removed from the sampling jar using stainless steel tongs/hemostats.

Wetting Agent

- n-hexane (a contaminant-specific solvent) for cotton gauze pad

Sampling Template

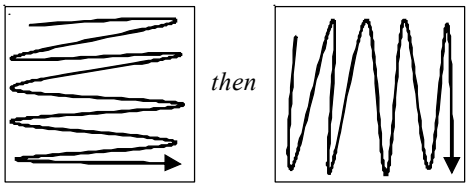
- 10 cm x 10 cm, cut from aluminum foil (100 $cm^2$ sample area)
- A disposable 100 $cm^2$ template should be used for each sample. The template may be cut from aluminum foil. A 100 $cm^2$ area may be a 10 cm x 10 cm square, a rectangle (e.g., 1 cm x 100 cm or 5 cm x 20 cm), or any other shape. The use of a template assists the sampler in the collection of a 100 $cm^2$ sample and in the selection of representative sampling locations. One template will be needed for each sample. Dispose of template after one use.
- If the area to be sampled is in a confined area and a template cannot be used, measure the sampling area with the tape measure, and delineate the area to be sampled with masking tape.

Wiping Pattern

Using the hemostats, the wipe will be swiped horizontally back and forth, top to bottom and vertically up and down, left to right to collect each sample as follows:

- Five horizontal swipes, zigzag back & forth, overlapping, top to bottom
- Five vertial swipes, zigzag up & down, from left to right

*(10 cm x 10 cm)*



Sample Jars

Samples should be stored in pre-cleaned 4 ounce glass with Teflon-lined caps at 4°C. Prior to sampling, place one Wash n' Dri™ hand wipe or gauze pad in each pre-cleaned 4-ounce glass sample jar. Wet the cotton gauze with a sufficient volume of wetting agent or solvent, such as 3 – 4 ml of n-hexane, without saturating the gauze. Most laboratories can supply the pre-wet wipes with the solvent in the sample jars. Seal the jar with a Teflon-lined cap, label the jar, and store the jar on blue ice (at 4 °C) until samples are collected. Do not open again until ready to collect the sample. After sample collection, sample jars will be stored and shipped to the laboratory on blue ice at 4°C.

DTSC does not recommend compositing of wipe samples because of sample preparation problems, analytical difficulties, and potential difficulties in data interpretation.

Sampling Procedures Steps

1. Wear two pairs of clean gloves.
2. Place the template over the surface area to be sampled, and secure the outside edges with masking tape.
3. Remove a Wash n' Dri™ hand wipe (or gauze pad) from its sampling jar, using stainless steel hemostat, and unfold it.

4a. Re-fold the wipe into fourths, and wipe the surface area with firm pressure. Use an overlapping "S" wiping pattern described above to cover the entire surface area with five (5) horizontal strokes.

4b. Fold the exposed side of the wipe in, and wipe the same area using five (5) vertical "S" strokes.

4c. Fold the wipe once more to reveal an unexposed surface, and wipe the surface a third time as described in Item 4a.

5. After sampling, fold the wipe, exposed side in, and place the wipe sample in its sample jar. Seal securely. Label the sample container clearly.
6. DTSC recommends a new, disposable template for each sample location; however, if a re-usable template is used, the template must be appropriately cleaned. Wipe the template off with the solvent, then wipe with distilled water, and then wipe dry. Store all used de-con wipes in a glass jar. Log the de-con jar as a sample on the chain of custody but no analyses are required. The jar will be disposed by the laboratory.
7. If hemostats are reused during the sampling procedure, they should be decontaminated in between each use for collecting individual samples. Information about a suitable decontamination agent should be requested from the laboratory.
8. Replace the outer pair of gloves for each sample. Discard gloves.

### *Analytical Recommendations*

- Analytical Methods: EPA Methods 8082A or 8270C. These EPA methods detect Aroclors only, not individual PCB congeners. They can be found at www.epa.gov/SW-846/main.htm. Aroclors are mixtures of PCBs. When released into the environment, these mixtures are weathered and partially degraded. Quantifying individual PCB congeners is more accurate, but also more expensive, and the Aroclor methods are the approved regulatory methods.
- Detection Limits: 0.1 micrograms per 100 square cm (ug/100-$cm^2$) or less
- Holding Time: Within 14 days of sample collection

## Health and Safety Standards

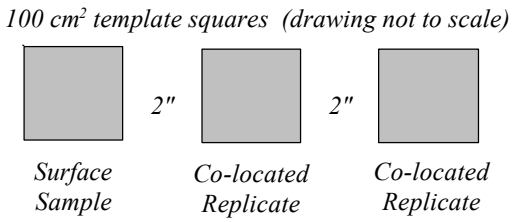
Appropriate chemical protective gloves should be utilized during collection of wipe samples. Used gloves will be disposed of in a durable, sealable bag, such as a ZipLock bag.

## Quality Assurance and Quality Control

Collection of quality control (QC) samples to support the sampling activity is necessary. This includes field QC samples and laboratory QC samples. Field QC samples include field/trip blanks and duplicates. Only one blank (field or trip) sample per day should be collected. Collection of background samples is not required because the detection limits specified above for the analytical methods will be utilized for data interpretation and screening risk evaluation.

Duplicates

Two co-located replicates will be collected in one of the classrooms. Replicates will be separated from the original sample and one another by approximately two inches, as shown below.




Field Blank (when proposed)

Before collection of the wipe samples, a selected hand wipe (or gauze pad) and solvent should be designated to generate a field blank. With clean gloves, each field blank should be collected by using a hemostat to remove the Wash n' Dri™ hand wipe (or gauze pad) from a sample jar. The Wash n' Dri™ hand wipe (or gauze pad) will be replaced in the sample jar without touching any surfaces.

Trip Blank (when proposed)

Each trip blank will be prepared by the laboratory by sealing the Wash n' Dri™ hand wipe (or wetting a gauze pad with n-hexane and sealing the pad) in a glass jar. This sample will be shipped to the field and returned with other sample jars having never been opened. The laboratory will prepare all wipes so the same solvent and gauze wipe are used for blank and collected samples.

## References

1. Ness, S.A. (1994). *Surface and Dermal Monitoring for Toxic Exposures*. Van Nostrand Reinhold, New York.

2. California Environmental Protection Agency, Department of Toxic Substances Control, Hazardous Materials Laboratory (1996). *Quality Assurance Project Plan*. Section B.2.

3. United States Environmental Protection Agency (1992). *PCB Regulations, 40 CFR Part 761, 07-01-92 Edition*. Part 761.123.

# Attachment D
# Air Sampling/Monitoring Plan (Protocols)

## Sampling Locations

Air samples should be collected from the selected classrooms, in consultation with the existing school administration and the Department of Toxic Substances Control (DTSC). A t least three classrooms should be selected. Additional classrooms may be sampled, depending on site conditions, accessibility, use, and proximity to the site.

Potential Sampling Zones

Samples should be collected from representative breathing zone heights. These heights should account for both adult and child sitting/standing positions. These samples can be area samples set up at the appropriate breathing zone heights. Breathing zone is defined as the volume surrounding the individual's nose and mouth from which he or she inhales breathing air. This zone can be pictured by inscribing a sphere with a radius of about 12 inches centered at the individuals' nose.

Classroom Characteristics

Rooms should be selected where there are reported or suspected PCB ballast leaks based on teacher and custodial staff reports or observation by DTSC. At least three breathing zone samples should be collected in each classroom: one child standing breathing zone, one child sitting breathing zone and one adult sitting or standing breathing zone.

## Sampling Procedures

Air samples should be collected in polyurethane foam (PUF) tubes in accordance with EPA Method TO-10A. For quick snap-shot sampling purposes, samples may be collected on standard Florisil sorbent tubes proceeded by a 15-millimeter fiberglass filter with calibrated vacuum pumps, operating at 0.2 liter per minute, in accordance with NIOSH Method 5503. After sample collection, sample tubes should be stored and shipped to the laboratory on blue ice. Appropriate chemical protective gloves should be utilized during collection of air samples. Used gloves will be disposed of in a durable, sealable bag, such as a ZipLock bag.

Sampling Considerations

- Air samples should be collected for approximately 8 hours with the classroom lights on in order to simulate actual classroom usage. Sampling collection times (start and end times) should be logged.
- Air monitoring should be conducted under a variety of environmental conditions including no ventilation in the room and ventilation operating at normal settings to determine possible variables in exposure.
- Sampling should be completed prior to extensive remediation to remove PCB surface contamination.

## Analytical Recommendations

Analytical Methods

- Polyurethane Foam (PUF) Tubes: TO-10A
- Florisil Sorbent Tubes: NIOSH 5503, EPA Methods 8082A, and 8270C

Detection Limits

- Polyurethane Foam (PUF) Tubes: 0.0030 micrograms per cubic meter ($ug/m^3$) or less
- Florisil Sorbent Tubes: 0.5 $ug/m^3$ or less

Holding Time

- Within 14 calendar days after collection

## Health and Safety Standards

U.S. EPA Region 9 Preliminary Remediation Goal for Ambient Air: 0.0034 ug/$m^3$
Cal/OSHA Permissible Exposure Limit (PEL*, for Arochlor 1242): 500 ug/$m^3$
NIOSH Recommended Exposure Limit (REL**): 1 ug/$m^3$
*PEL is based on an 8-hour time weighted average.
**REL was established as a guideline to prevent possible health effects associated with PCBs including potential for cancer, skin, liver and reproductive effects and tumors of the liver and pituitary gland.

## Quality Assurance and Quality Control

Collection of quality control (QC) samples to support the sampling activity is necessary. This includes field QC samples and laboratory QC samples. Field QC samples include trip blanks, duplicates and background samples. The Preliminary Remediation Goal (PRG) of 0.0034 ug/$m^3$ established by U.S. EPA Region 9 for PCBs in ambient air will be utilized for data interpretation and screening risk evaluation.

Duplicates

One co-located replicate per day will be collected in one of the classrooms. Replicates will be separated from the original sample and one another by approximately two feet.

Trip Blanks

A trip blank should either be an unused Florisil sorbent tube or a Summa canister filled with ultra pure air depending on the sample technique. Each trip blank will be prepared by the laboratory. This sample will be shipped to the field and returned with other sample containers having never been opened.

Background Samples

One outdoor, upwind sampl1e should be collected for approximately eight hours during the same time period of the samples to determine background concentrations.

## References


1. California Environmental Protection Agency, Department of Toxic Substances Control, Hazardous Materials Laboratory (1996). *Quality Assurance Project Plan*.

2. United States Environmental Protection Agency (1992). *PCB Regulations, 40 CFR Part 761, 07-01-92 Edition*. Part 761.123.